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Original Article

Concomitant trocar-guided transvaginal mesh surgery with a midurethral sling in treating advanced pelvic organ prolapse associated with stress or occult stress urinary incontinence

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Abstract

Objective: The purpose of this study was to evaluate the efficacy and feasibility of concomitant trocar-guided transvaginal mesh (TVM) surgery with a midurethral sling (MUS) for treating women with advanced pelvic organ prolapse (POP) and stress urinary incontinence (SUI) or occult SUI (OSUI).
Materials and methods: Eighty-nine women with advanced POP and SUI or OSUI were retrospectively enrolled. The Total Prolift and Tension-free Vaginal Tape-Obturator Systems were used for trocar-guided TVM surgery and MUS. Patients received regular follow-up at 1 week, and 1 month, 3 months, 6 months, and 12 months postoperatively, and then annually thereafter. The endpoints were the success rate for POP, and perioperative and postoperative complications. Functional outcomes were the presence of voiding difficulty, persistent or *de novo* overactive bladder symptoms, postoperative SUI, and paresthesia.
Results: The median follow-up period was 35 months (range, 12–50 months). Within the follow-up period, 84 patients (94.4%) were objectively cured, five patients (5.6%) had vaginal apical mesh exposure, 29 individuals (32.6%) had persistent or *de novo* overactive bladder symptoms, six individuals (22.5%) had *de novo* SUI (two were found by urodynamics), and nine individuals (10.1%) had voiding difficulties (two were found by urodynamics). In addition, the vaginal hysterectomy group had greater blood loss, longer operation times, and a higher mesh erosion rate compared to the uterine suspension group.
Conclusion: Concomitant trocar-guided TVM surgery and MUS with the use of total Prolift and Tension-free Vaginal Tape-Obturator offer good efficacy in treating women with advanced POP and SUI or OSUI. The vaginal hysterectomy group had more perioperative complications.

Keywords: midurethral sling; occult stress urinary incontinence; pelvic organ prolapse; stress urinary incontinence; transvaginal mesh

Introduction

Pelvic organ prolapse (POP) and stress urinary incontinence (SUI) often occur concomitantly. They are estimated to occur in 15–80% of women with pelvic floor dysfunction [1]. The large variation in the prevalence may be due to the absence of urine leakage in their daily activities, which only becomes apparent during clinical evaluation or urodynamic

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testing with prolapse reduction. The use of the term occult SUI (OSUI) is inconsistent in the medical literature, and is also interchangeably referred to as masked, latent, hidden, iatrogenic, or potential SUI [2]. The incidence of OSUI with advanced POP is 36–80% with prolapse reduction [3–7]. There are three presentations in women with advanced POP: (1) those without subjective or objective SUI; (2) those with subjective or objective SUI; and (3) those without subjective SUI, but which can be demonstrated objectively with the use of prolapse reduction.

Postoperative SUI (POSUI) is still a challenging problem during surgery for POP [8]. POSUI, which is also called *de novo* SUI, refers to new symptomatic SUI after an operation. It is estimated that 11–65% of continent patients with severe POP will develop POSUI with no prophylactic anti-incontinence procedures [9–12]. The large discrepancy may come from different definitions of POSUI and heterogeneity among study participants. Additional anti-incontinence procedures may prevent the occurrence of POSUI. However, the challenge of dealing with women with POP is figuring out the advantages and disadvantages of either concomitant or staged anti-incontinence surgeries. Also, uncertainty of preoperative evaluation methods exists in that they may be ambiguously asymptomatic or show no leakage during prolapse reduction testing in a patient with advanced prolapse [13].

Approaches include either concomitant or staged surgeries with the aid of a prolapse reduction test [14]. It is desirable to combine anti-incontinence and POP surgery at the same time to minimize anesthetic risks and subject a patient to a single convalescent period. Trocar-guided transvaginal mesh (TVM) surgery with the use of a commercial kit that delivers a polypropylene mesh through a vaginal approach has the advantages of minimal invasiveness and time efficiency [15,16]. Interest has been expressed in the concomitant use of trocar-guided TVM surgery and MUS performed at the same time as POP surgery [2,13].

The aim of this study was to evaluate the efficacy and feasibility of trocar-guided TVM surgery and MUS to treat women with advanced POP associated with SUI or OSUI. In addition, we also evaluated the effects of a vaginal hysterectomy (VH) at the time of trocar-guided TVM surgery on perioperative complication rates, compared to the vault suspension and uterine suspension group.

Materials and methods

After obtaining Institutional Review Board approval, we reviewed medical records of women with advanced POP associated with either SUI or OSUI who had undergone concomitant trocar-guided TVM surgery and MUS, between May 2007 and July 2010. Total Prolift and Tension-free Vaginal Tape-Obturator Systems (Gynecare, Ethicon, Somerville, NJ, USA) were used for trocar-guided TVM surgery and the MUS procedures, respectively. Initially, 95 consecutive patients were identified for inclusion, but six were excluded because of loss to follow-up. In total, 89 women were recruited for further analysis.

A standard interview included information regarding age, parity, diabetes mellitus (DM), body mass index (BMI), prior pelvic reconstructive surgery or a hysterectomy, menopause, and hormone replacement therapy status. Preoperatively, all patients underwent a 1-hour pad test, cough stress test, and multichannel urodynamic evaluation, according to a report on good urodynamic practice by Schafer et al [17]. The cough stress test was performed in a 45° lithotomy position at a bladder volume of 150 mL and at maximum bladder capacity. A diagnosis of urodynamic stress incontinence was made in patients with a positive 1-hour pad test and observable leakage during the cough stress test, without demonstrated detrusor overactivity (DO) during cystometry. OSUI was defined as no subjective SUI, with urine leakage only being demonstrated after prolapse reduction during urodynamic testing.

All patients diagnosed with advanced POP [Stage III or IV, according to the Pelvic-Organ-Prolapse Quantification (POP-Q) system and 2010 International Urogynecological Association/International Continence Society definitions] [18] and SUI or OSUI underwent concomitant trocar-guided TVM surgery and MUS. All procedures were performed by the senior gynecologist with a specialty in pelvic reconstructive surgery (K.-H. Huang) and experience with more than 800 trocar-guided TVM surgeries. General or spinal anesthesia was applied according to the patient and anesthetist preferences. The operative procedures were as follows: first, the patient received VH according to patient preference, followed by trocar-guided TVM surgery with the total Prolift according to the manufacturer's guidelines. A vasoconstrictive agent (300 mL) with diluted epinephrine was injected into both the anterior and posterior vaginal walls to assist further dissection and minimize blood loss (0.5 mL of 1 mg/mL adrenaline added to 500 mL normal saline, for a total injection volume of 120–160 mL). After completing the trocar-guided TVM surgery, TVT-O was performed with a separate vaginal incision about 2.5 cm long from 1 cm below the external urethra to the upper bladder neck. The TVT-O tape was inserted with an inside-out approach, which was adjusted by Metzenbaum scissors inserted between the suburethra and tape. Afterward, a number 8 Hegar dilator (Richard Wolf Medical Instruments, Rosemont, IL, USA) was inserted into the urethra to confirm the patency of the urethra without bladder outlet obstruction (BOO). A provocative stress test with manual suprapubic pressure was used intraoperatively to facilitate adjustment of the TVT-O. Cystoscopy was performed on all patients prior to the end of surgery to exclude any bladder injury and confirm the bladder integrity. All patients were given intravenous prophylactic antibiotics, 1 g cefazolin administered 30 minutes preoperatively and every 8 hours until 2–3 days postoperatively.

The Foley catheter was removed 24–72 hours postoperatively; then, patients were monitored with an intermittent catheterization program. The program included an evaluation of the postvoiding residual (PVR) volume with a bladder scan (BVI 3000; Diagnostic Ultrasound, Bothell, WA, USA) every 4 hours. If the PVR volume was <50 mL or $<20\%$ of the voided urine, the patient was discharged. If the PVR volume

exceeded 100 mL, sterile, intermittent catheterization was performed. If the PVR volume persistently exceeded 150 mL for 1 day after removal of the Foley catheter, a cholinergic agent and α blocker were prescribed. If the PVR volume persistently exceeded 150 mL for 2 days after removal of the Foley catheter, a Hegar dilator was inserted into the urethra with a downward push on the proximal urethra. Women with a PVR volume persistently above 100 mL for >7 days after removal of the Foley catheter were taught clean intermittent self-catheterization.

Patients were followed-up at 1 week, and 1 month, 3 months, 6 months, and 12 months postoperatively, and then annually thereafter. During the first two visits, we checked wound healing and PVR volumes. At each visit, we assessed urinary and other relevant symptoms, and changes in the POP-Q stage. All patients underwent a repeat urodynamic evaluation at 6 months postoperatively.

The endpoints were the success rate for POP (recurrence of prolapse defined as the most distal portion of POP of Stage II or greater), perioperative and postoperative complications, length of hospital stay, operative time, blood loss during surgery, duration of the urine indwelling catheter, bladder or ureter injury, bowel injury, and mesh exposure or extrusion [19]. Functional outcomes were the presence of voiding difficulty, persistent or *de novo* overactive bladder (OAB) symptoms, POSUI, and paresthesia (e.g., pain, numbness, or weakness over the groin, vagina, buttocks, or thighs). Data were analyzed using SPSS software Version 15.0 (SPSS Inc., Chicago, IL, USA). A paired-sample *t* test was used to compare preoperative and postoperative data. If 25% of cells had expected counts of <5 among the categorical variables, Fisher's exact test was performed. A *p* value <0.05 was considered significant.

Results

Baseline characteristics for the 89 patients, including age, parity, body mass index, previous pelvic surgery, and type of urinary incontinence, are listed in Table 1. The median follow-up period was 35 months (range, 12–50 months). The operative time, blood loss, length of hospital stay, mesh erosion, and POP recurrence are listed in Table 2. Operative times in the VH group, vault suspension group (with a previous hysterectomy), and uterine suspension group (with uterine preservation) were 158.24 ± 15.94 minutes, 129.55 ± 19.45 minutes, and 132.19 ± 21.74 minutes ($p < 0.0001$); blood loss values were 200.0 ± 141.42 mL, 104.0 ± 63.69 mL, and 141.35 ± 113.21 mL ($p = 0.0344$); and lengths of hospital stay were 6.18 ± 3.15 days, 5.85 ± 1.42 days, and 5.40 ± 1.27 days, respectively ($p = 0.2625$; Table 2). Trocar-guided TVM surgery with VH had a longer operation time ($p < 0.01$) and greater blood loss ($p = 0.03$) compared to the vault suspension and uterine suspension group. Mesh erosion was more commonly encountered in the VH and vault prolapse group compared to the uterine suspension group ($p = 0.01$ by Fisher's exact test). Five of 89 (5.6%) patients had recurrent POP: three cases with Stage II, one case with Stage III, and one case with Stage IV. Four among the five cases with POP recurrence occurred in the uterine suspension group. Women at Stage III and Stage IV received sacrospinous ligament fixation, with no subsequent prolapse (Table 2). All of the POP-Q parameters significantly improved at the 6-month follow-up, and all $p < 0.001$ (Table 3).

Table 1
Patient characteristics ($n = 89$).

Characteristic	Mean ± SD (min–max)
Age (y)	66.06 ± 9.29 (43–86)
Parity	4.12 ± 1.52 (2–9)
Body mass index	24.64 ± 3.63 (12.49–32.89)
Comorbidity	
Diabetes mellitus	16
Menopause	80
Hormone replacement therapy	38
Previous pelvic surgery	
TAH	12
VH + A-P repair	7
LAVH	1
Burch colposuspension	1
MUS	1
Type of urinary incontinence	
Pure stress urinary incontinence	21
Occult stress urinary incontinence	42
Mixed stress urinary incontinence	26 (9 SUI, 17 OSUI)

A–P repair = anterior–posterior colporrhaphy; LAVH = laparoscopic-assisted vaginal hysteroscopy; MUS = midurethral sling; OSUI = occult stress urinary incontinence; SUI = urinary incontinence; TAH = total abdominal hysterectomy; UI = urinary incontinence.

All 89 patients were regularly followed-up with an urodynamic study at 6 months postoperatively. Among them, urodynamic parameters were available in 69 patients (20 patients were unavailable due to personal reasons) and are listed in Table 4. Postoperatively, patients had a higher maximum flow rate (Qmax) and mean flow rate (Qmean), with $p < 0.001$ and $p < 0.013$, respectively; lower PVR volume and maximum urethral closure pressure (MUCP), with $p < 0.001$ and $p < 0.009$, respectively; and no significant changes in the first sensation of bladder filling, functional urethral length, or maximum cystometric capacity.

Perioperative and postoperative complications were also evaluated and are listed in Table 5. There were two vaginal hematomas; one was uneventful after conservative management; the other vaginal hematoma measured 6 cm × 5 cm and was located beneath the bladder base. This patient received a blood transfusion, antibiotics, prolonged hospital stay (18 days, the longest in this study), and an indwelling urinary catheter for 3 weeks. Postoperatively, five of 89 (5.6%) patients had vaginal apical mesh exposure, and all of the episodes were asymptomatic, without infection signs. Of these, three cases underwent local excision for the exposed portion of the mesh (<1 cm) with no further mesh erosion afterward. One recovered well after topical vaginal estrogen cream application. The remaining patient refused local excision and topical vaginal estrogen cream. She had persistent asymptomatic mesh exposure and no infection signs.

Twenty-nine of 89 (32.6%) patients had postoperative persistent or *de novo* OAB symptoms, and symptoms were resolved with antimuscarinic treatment. DO was demonstrated

Table 2
Operative time, blood loss, length of hospital stay, mesh erosion, and POP recurrence among the three groups ($n = 89$).

	Total[a]	Group 1[b] VH	Group 2[c] Vault suspension	Group 3[d] Uterine suspension	p
$n =$	89	17 (19.1)	20 (22.5)	52 (58.4)	
Operative time (min)	136.57 ± 2.70 (79–205)	158.24 ± 15.94 (130–180)	129.55 ± 19.45 (80–161)	132.19 ± 21.74 (79–205)	<0.01
Blood loss (mL)	144.16 ± 113.64 (30–600)	200.00 ± 141.42 (50–550)	104.00 ± 63.69 (30–250)	141.35 ± 113.21 (50–600)	0.03
Hospital stay (d)	5.65 ± 1.81 (4–18)	6.18 ± 3.15 (4–18)	5.85 ± 1.42 (4–9)	5.40 ± 1.27 (4–9)	0.26
Mesh erosion	5/89 (5.6)	3/17 (17.6)	2/20 (10.0)	0/52 (0)	0.01[e]
POP recurrence	5 (5.6)	1/17 (5.9), Stage II	0/20 (0)	4/52 (7.7) Stage IV, III, II (2)	NA

Data are presented as mean ± SD (min–max) or *n*/*N* (%).
NA = not applicable; POP = pelvic organ prolapse; SD = standard deviation; TVM = transvaginal mesh; VH = vaginal hysterectomy.
[a] All patients received tension-free vaginal tape as a midurethral sling; [b] Group 1, VH + TVM; [c] Group 2, vault suspension + TVM; [d] Group 3, uterine suspension + TVM; [e] According to Fisher's exact test.

in 10 patients. All of them had persistent OAB symptoms. Nine of 89 patients (32.7%) had voiding difficulties with subjective symptoms, for example, difficult emptying, a sensation of incomplete voiding, hesitancy, weak or prolonged flow, intermittent flow, postvoiding dribbling, and the need to change position to facilitate micturition postoperatively, and only two of them were demonstrated by the postoperative urodynamic study. In our study, 55 of 57 (96.5%) patients with preoperative voiding difficulty were cured. One patient had the MUS removed 18 months postoperatively due to detrusor underactivity, and no recurrent SUI was found at follow-up. There were 20 of 89 (22.5%) patients with POSUI; eight of them had preoperatively severe SUI (1-hour pad test > 10 g); none considered their urinary leakage bothersome, and no additional anti-incontinence surgery was needed. Six of them were diagnosed by objective urodynamics, and none of them had intrinsic sphincter deficiency with low MUCP (Table 5).

Discussion

We reported the efficacy and feasibility of concomitant trocar-guided TVM surgery and MUS with the use of total Prolift and TVT-O in treating women with advanced POP and SUI or OSUI. However, the optimal use of anti-incontinence surgery during pelvic reconstructive surgery remains a matter of debate [20,21]. Performing concomitant trocar-guided TVM surgery and MUS surgery has the advantage of using the same route without other additional incisions. The updated 2010 American Urological Association Guidelines for Surgical Management of Female Stress Urinary Incontinence reported a comparable cure rate and safe use of concomitant surgery for SUI and POP in appropriately selected women [22].

We recently reviewed the literature to elucidate MUS as a prophylactic procedure during POP surgery [13]. Liang et al [23] recommended TVT for OSUI patients undergoing reconstructive surgery if there was a positive pessary reduction test. The POSUI was 9.4% (3/32) in the TVT group compared to 64.7% (11/17) in the no-TVT group when the pessary test was positive [23]. On the contrary, de Tayrac et al [24] opposed the use of TVT in OSUI, because TVT had a similar effect (0%, 0/11) in POSUI, compared to the control group (12.5%, 1/8; $p > 0.05$), with a higher risk, for example, more voiding dysfunction (27.3%, 3/11 vs. 0%, 0/8; $p > 0.05$). The above two TVT studies with a controlled non-intervention arm reported differing results with limited case numbers. Thereafter, a randomized controlled trial by Meschia et al [25] reported significantly lower subjective and objective POSUI rates in the TVT group compared to the endopelvic fascia plication group. Araki et al [26] reported the protective effect of a transobturator midurethral sling (TOT) for women with OSUI. POSUI developed in none of the concomitant TOT group and developed in 62% (8/13) of the non-TOT group.

Iatrogenic BOO might potentially increase, because the number of patients undergoing anti-incontinence surgery has dramatically increased in recent years [27,28]. BOO was reported to occur in 5–20% of patients undergoing anti-incontinence surgery [29]. BOO patients can present with subtle obstructive or irritative symptoms, for example, bending

Table 3
Comparison of POP-Q parameters between preoperative conditions and those at 6 months postoperatively ($n = 89$).

POP-Q	Preoperative	Postoperative	p
Aa	2.96 ± 0.26	−2.83 ± 0.83	<0.001
Ba	6.03 ± 1.62	−2.80 ± 0.93	<0.001
C	5.97 ± 1.70	−6.89 ± 2.58	<0.001
Ap	2.72 ± 0.80	−2.98 ± 0.13	<0.001
Bp	4.91 ± 2.39	−3.01 ± 0.24	<0.001
TVL	7.72 ± 1.20	8.18 ± 0.97	<0.001
Gh	5.40 ± 0.85	3.89 ± 0.64	<0.001
Pb	2.84 ± 0.69	3.70 ± 0.56	<0.001

Data are presented as mean ± SD.
POP-Q = pelvic organ prolapse quantification.

Table 4
Comparison of the 1-hour pad test and urodynamic parameters between the preoperative and postoperative conditions ($n = 69/89$).

	Preoperative	Postoperative	p
1-h pad test (g)	6.22 ± 15.18	0.23 ± 0.93	0.002
Qmax (mL/s)	14.97 ± 10.92	21.46 ± 8.79	<0.001
Qmean (mL/s)	6.61 ± 5.16	8.54 ± 3.84	0.013
PVR (mL)	83.59 ± 52.97	23.52 ± 28.56	<0.001
FS (mL)	145.06 ± 46.20	157.42 ± 76.36	0.185
MCC (mL)	335.83 ± 86.73	355.17 ± 89.97	0.104
MUCP (cmH_2O)	69.20 ± 27.53	59.02 ± 23.44	0.009
FUL (cm)	33.43 ± 9.83	31.23 ± 8.77	0.147

Data are presented as mean ± SD.
FS = first sensation of bladder filling; FUL = functional urethral length; MCC = maximum cystometric capacity; MUCP = maximum urethral closure pressure; PVR = post-void residual urine; Qmax = maximum flow rate; Qmean = mean flow rate.

Table 5
Perioperative morbidities and postoperative complications ($n = 89$).

	n (%)
Perioperative morbidity	
Blood transfusion	1 (1.1)
Hematoma	2 (2.2)
Bladder or ureter injury	0
Bowel injury	0
Duration of urine indwelling catheterization (d)	
1–3	78 (87.6)
4–5	7 (7.9) (ICP[a] ± medical treatment)
≥6	4 (4.5%) (2 urethral downward with Hegar dilator, 1 CISC, 1 prolonged indwelling catheterization[b])
Postoperative complication	*n* (%) (description of management)
Mesh exposure	5 (5.6) (3 excision, 2 vaginal estrogen cream)
Abnormal sensation	8 (9.0) (no analgesics needed)
OAB symptoms	29/89 (32.6)
Persistent OAB	20/26 (77.9) (10 DO on urodynamics)
De novo OAB	9/63 (14.3)
Voiding difficulties	9 (32.68) (2 evidenced on urodynamics)
POSUI	20 (22.5) (6 evidenced on urodynamics)

CISC = clean intermittent self-catheterization; ICP = intermittent catheterization program; OAB = overactive bladder; POSUI = postoperative stress urinary incontinence.
[a] ICP was associated with a bladder scan and sterilized intermittent catheterization; [b] Indwelling urinary catheterization for 3 weeks.

forward to void or having to change positions to empty [29]. An elevated detrusor pressure not commensurate with the flow indicates an obstructive element in a non-neurogenic patient by urodynamics; however, threshold criteria for obstruction continue to be debated [30]. Vaginal tape can be adjusted according to an intraoperative provocative stress test [31,32]. Yet, the technique can cause potential overtightening of the tape. In our study, we used a Hegar dilator inserted into the urethra to push the proximal urethra downward during the early postoperative phase. In case of postoperative voiding difficulty due to BOO occurring after anti-incontinence surgery, a salvage procedure, for example, cutting the synthetic suburethral sling would likely improve obstructive symptoms, but not irritative symptoms [33].

It is difficult to determine the etiology of postoperative urinary retention (PUR) even after a delicate preoperative urodynamic study. There are various explanations for this, for example, detrusor underactivity, undue urethral elevation, urethral stricture, anxiety, or excessive tension of MUS [29]. Although medication with cholinergic and α blocker was helpful in immediate PUR cases in our study, use of drugs that directly or indirectly act as parasympathomimetics remains in dispute due to their low efficacy and high prevalence of side effects [34]. Sterile or clean intermittent catheterization can also be helpful in relieving symptoms. Prolonged indwelling catheterization can be used for cases with prolonged PUR.

We attributed our low morbidities to a completed learning curve during the conduct of this study [35]. Mesh erosion or exposure has raised great concerns directly related to the insertion of prostheses [19]. DM is a possible risk factor for mesh erosion; however, no mesh exposure patient had DM in our study. Therefore, patients with well-controlled DM do not have an increased risk of mesh exposure. Mesh exposure can be managed with simple full-thickness excision of the exposed mesh, generally as an outpatient procedure, with resolution of bothersome symptoms [36]. As a result of potential serious consequences, complex excisions should be performed in skilled centers [37]. Mesh exposure did not occur in our uterine suspension group, compared to the VH group or vault suspension group. Uterine preservation, avoiding anterior inverted "T" incisions, placing the mesh beneath the full thickness of the vaginal wall, and suturing the vaginal wall in two layers were proposed to reduce the occurrence of mesh exposure [36]. Four of five POP recurrences occurred in the uterine suspension group. The reason for the discrepancy between the group with and that without VH remains unclear. Lin et al [38] proposed the presence of an elongated cervix, whereas Jeon et al [39] attributed POP recurrence to the mesh, instead of a hysterectomy.

In concordance with the report of Ek et al [40], we found a decrease in MUCP and PVR volume, and increases in Qmax and Qmean after surgery, which may have resulted in more POSUI after TVM surgery, compared to colporrhaphy. Aungst et al [15] reported POSUI as high as 24.3% after trocar-guided TVM surgery. In addition to an intrinsic sphincter deficiency, age, and DM, we further identified severe preoperative SUI as a risk factor for POSUI. It is currently not our practice to perform a routine concomitant anti-incontinence procedure on stress-continent women undergoing trocar-guided TVM surgery unless there is preoperative evidence of SUI or OSUI. It demands emphasis of the potential risks of POSUI in preoperative counseling and explaining that interval outpatient therapies are available to manage new-onset SUI should it occur and become bothersome [40].

The prevalence of OAB symptoms is greater in patients with POP, and POP induces OAB symptoms and DO signs [41]. Patients with preoperative OAB symptoms are more likely to have persistent symptoms postoperatively. In our series, preoperative OAB was found to be a predictor of postoperative OAB, that is, persistent (20/26, 77%) versus *de novo* (9/63, 14%) OAB symptoms. BOO may play an important role in postoperative OAB [41–43]. It is unclear which risk factors predict whether OAB symptoms will disappear. DO was thought to be a predictor [41,44]. All cases with preoperative DO had persistent OAB. By contrast, Fletcher et al [45] reported a significantly lower preoperative detrusor pressure at maximum flow (PdetQmax; 17 vs. 24 cmH_2O, $p = 0.042$) [45]. An increase in postoperative OAB symptoms (14%) was noted in the current study. However, the etiology of *de novo* OAB symptoms remains controversial, and the position and tightness of the tape may play an important role.

One limitation of the present study was that we did not assess the postoperative quality of life or sexual dysfunction, although a higher rate of dyspareunia following trocar-guided TVM surgery was anticipated. Second, the case numbers of our study were not large enough to be randomized into a group of MUS versus non-MUS at the time of trocar-guided TVM surgery.

We conclude that concomitant trocar-guided TVM surgery and MUS offer good efficacy and feasibility in treating women with POP and SUI or OSUI. However, concerns should be raised regarding potential harmful consequences due to such an intervention, particularly technique-related morbidity (bleeding, organ injury, and mesh exposure). One single treatment strategy cannot fit every woman. Certainly, patient input should be taken into account as well, and a frank discussion of the pros and cons of concomitant surgery should occur between the surgeon and patient prior to surgery.

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